

REMARKS

The paragraph noted in the section above entitled "Amendments to the Specification" was amended to express in more explicit terminology aspects discussed elsewhere in the specification and explicitly depicted in the drawings as originally submitted. Accordingly, Applicants' Attorney submits that these amendments, while providing more express antecedent basis in parallel language for limitations appearing in the new claims submitted above and discussed below, do not constitute "new matter."

In re Claim Objections

Original claims 1-19 have been canceled as noted in the amendments section above. In his Office Action of January 25, 2005, the Examiner objected to original claims 1, 2, 4, 7, 11, 13, 15, 17 and 18 on the grounds that the use of "adapted to" does not require steps to be performed or does not limit a claim to a particular structure. This objection with regard to these same claims was the subject of a telephonic interview between Examiner Mariam and Applicant's Attorney on January 19, 2005 and of a "Draft Amendment" submitted to the Examiner on the same date. As noted during the telephonic interview and in the Remarks section of Applicant's January 19th Draft Amendment when an Examiner's Amendment was contemplated and anticipated by Applicant's Attorney and the Examiner:

As discussed, Applicant's Attorney wishes also to make explicit for the record that the changes to be made by Examiner's amendment are formalistic in nature and agreed to by the Applicant because they are regarded as not affecting the scope of any claim in which the noted change(s) are to be made. We respectfully request that either this document itself be included as part of the Interview Summary or that clear language indicating the aforementioned understanding regarding claim scope be included by the Examiner in his Interview Summary.

(Page 2, Applicant's Draft Amendment, January 19, 2005)

Applicants' Attorney presently notes that, although an Examiner's Amendment concerning the change from "adapted to" to "configured to" is no longer anticipated, the Applicants' Attorney's reason for the inclusion of "configured to" rather than "adapted to" in the new claims submitted herewith remains the same as that provided in the remarks quoted above. Also noted is that there appear no occurrences of "adapted to" in the newly submitted claims and, therefore, all stated objections relative to the original claims have been overcome.

In re Claim Rejections under 35 U.S.C. § 112

Alleging that they are indefinite for failing to particularly point and distinctly claim the subject matter Applicants regard as the invention, the Examiner rejected claims 3, 9-10 and 14 under the second paragraph of 35 USC § 112. More specifically, the Examiner stated that it is unclear how the neural network is trained to recognize *variously configured versions of the same character* (emphasis Examiner) by communicating to the neural network a plurality of variously configured feature vectors corresponding to variously configured character images and instructing the neural network as to the desired output character to be associated with the variously configured feature vectors.

Original claims 3, 9-10 and 14 correspond in general subject matter to new claims 22, 25 and 28. The wording in new claims 22, 25 and 28 differs slightly from the wording of original claims 3, 9-10 and 14, and, Applicants' Attorney submits, renders definite and particular new claims 22, 25 and 28. As explained on page 5, line 27 through page 6, line 8 and on page 26, lines 5 through 15 of the specification in conjunction with FIG. 8, and now clarified in claims 22, 25 and 28, the neural network is trained to recognize variously configured versions of a particular character (e.g., the letter "A") by communicating to the neural network variously configured character images representative of the particular character (e.g., "A") and instructing the neural network that it should identify (recognize) the variously configured images as being

representative of the same character. This concept is stated in slightly different terms in the claims and specification, but in terms that nonetheless clearly convey the same concept. The purpose, the Examiner will appreciate, is so that the neural network can recognize variations in how a particular letter or number, for example, is represented by different typed fonts and humans' handwriting. The training exposes the neural network to numerous varied experiences of what it is instructed, during training, to recognize as the same character. Applicants' Attorney submits that the modified language of new claims 22, 25 and 28 clarifies these limitations and, furthermore, that the clarified language finds antecedent support in the specification and drawings as originally submitted.

In re Claim Rejections under 35 U.S.C. § 103

In his January 25, 2005 Office Action, the Examiner rejected original claims 1-2, 4-8, 11-13 and 15-19 under 35 U.S.C. 103(a) as unpatentable over Stone et al. (4,628,532) in view of Kuwano et al. (6,501,856). Included among the claims rejected under Section 103 were independent claims 1, 7, 13 and 18. The Examiner further stated that "[c]laim 1 is rejected the same as claim 7 except that claim 1 is a method claim."

As noted previously, every claim originally submitted has been cancelled and new claims 20 through 31 are submitted herewith for entry in the case. Since, as the Examiner well knows, the status of an independent claim as "allowable" renders allowable every claim depending from that independent claim, Applicant's Attorney focuses primarily on new independent claims 20, 24 and 27 which correspond generally, through not identically, to the subject matter of, respectively, original claims (i) 1 and 5, (ii) 7 and 8 and (iii) 13, and relies upon the argued-for allowability of these claims to support the allowability of the claims depending therefrom.

In connection with original claim 7, the Examiner noted, quite correctly, that Stone's method is essentially that of "boundary tracing." By this observation, the

Examiner apparently more-than-implicitly agrees that the method by which Stone scans and extracts features is not suggestive of the manner in which scanning is accomplished in the invention under examination. Instead, the Examiner combines the feature-vector-assembling aspects of Stone with the scanning methods taught by Kuwano to support a rejection under 35 USC 103. More specifically, in rejecting original claim 7, the Examiner notes that Kuwano calls for scanning a character image along each scan angle of a predetermined set of scan angles and cites, in support of this observation, column 29, line 60 through column 30, line 15. The Examiner then notes, on page 4 of the Examiner's Action, that the cited teachings of Stone and Kuwano are combinable because they are from the same field of endeavor. Moreover, the Examiner states, "the motivation for the combination is that the combination would at least minimize the processing time by scanning the character image along prescribed directions" and that, "[t]herefore, it would have been obvious to combine Kuwano et al. with Stone to obtain the invention as specified in claim 7." Applicants' Attorney submits, for the reasons articulated below, that whether a motivation exists to combine Stone and Kuwano is not relevant because the combination of Kuwano and Stone does not "obtain the invention" as specified in any of new claims 20, 24, and 27.

Applicants' Attorney first notes, less by way argument than of observation, that the real advantage of Kuwano over Stone probably has more to do with accuracy in the identification of characters than reducing processing time. Stone is a much earlier reference based in the identification and tracing of the contours of boundaries between character and background pixels and then, based on features such as concavity, convexity and linearity of those boundaries, or sections of those boundaries, attempting to identify the traced character. The boundary between background pixels and character pixels is essentially one-dimensional, at least at any given instant at which a decision needs to be made as to which direction each successive tracing vector should take. The identification of one-dimensional features, such as that performed in, for example, the process of "skeletal feature" identification are, as noted on page 3 in the Applicants' application summary, susceptible to the signal-damaging effects of noise

because the thinner the representation of a feature (e.g., a contour in the case of Stone), the closer in size the representation is to the magnitude of typical noise. While the technique taught by Kuwano apparently reduces the effects of noise, a full contextual examination of the text of Kuwano surrounding the text selected for citation by the Examiner indicates that Kuwano's technique is actually quite computationally intensive and, in any event, substantially different from the presently claimed technique. Applicant's Attorney refers more specifically to selected disclosure included between column 29, line 25 and column 38, line 32, and, most illustratively, FIGS. 48, 58 and 59.

A summary of the Kuwano technique with respect to white background pixels, for example, involves dividing the character image into plural mesh regions. Within each mesh region, a pixel detection unit detects each pixel and determines whether it is a black character pixel or a white background pixel. Then, for each white pixel in each mesh region (emphasis supplied), obtaining the run-length of the white pixels in each of eight directions and, based on this, acquiring a direction contributivity value indicating a distribution of respective direction components of the white pixels from the white pixel run-lengths and then normalizing a summation or count of the direction contributivity values in each mesh region (for all eight directions) by the number of white pixels in each mesh region. See column 30, lines 5 through 23

Beginning at column 31, line 4, Kuwano explains in greater detail how the direction contributivity for each detected white pixel is calculated. Kuwano explains:

" . . . The white pixel run-length measurement unit 3033 sets the detected pixel as a reference point (step 3061) and detects a neighboring pixel by extending the scanning line in each direction, and judges whether the neighboring pixel in the scanning direction is white or not (step 3062). When the neighboring pixel in the scanning direction is white, the run-length counter is incremented by one (step 3063), the neighboring pixel is newly set as a reference point (step 3064), and the scanning processing is repeated. . . When the neighboring pixel in the scanning direction is black or when there is no neighboring pixel in the scanning direction, the scanning is finished (step 3065). This processing is carried out for all of the eight directions (step 3066). The white pixel run-lengths for the eight directions are then given to the direction contributivity calculation unit 3034. . .

The direction contributivity calculation unit 3034 accumulates the white pixel run-lengths for the eight directions obtained from each white pixel, using the straightforward summation or the square root of square sum (steps 3067, 3068). Then, the direction contributivity of each direction is calculated by dividing the white pixel run-length of each direction by the white pixel run-length accumulated value (steps 3069, 3070). The direction contributivity f of each white pixel so obtained can be expressed in a form of an eight-dimensional vector given by:

$$f = (\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8)$$

where $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7$, and α_8 are the direction contributivity components of the eight directions respectively

(Kuwano col. 31, lines 4 through 38, emphasis added)

Based on the explanation above, it is clear that Kuwano's technique calls for regarding each pixel within a region of like-kind pixels (e.g., white) as an origin, at one time or another during a feature scanning operation, from which a plurality of radial scan lines emanates to ascertain the number of uninterrupted like-kind pixels extending in each of the scan directions (e.g., the eight scan directions specified) from the origin pixel. A pixel count for each radial scan direction is associated with the origin pixel. In other words, Kuwano essentially associates an eight-dimensional function (i.e., $f = (\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8)$, see col. 31, line 34) with each and every pixel within a specified region from which radial scan lines emanate. Moreover, as explained by Kuwano with respect to a white origin or reference pixel, *"when the neighboring pixel in the scanning direction is black or when there is no neighboring pixel in the scanning direction, the scanning is finished."* In other words, each radial scan line of Kuwano terminates at the last like-kind pixel in a particular scan direction. Kuwano's FIGS. 48, 58 and 59 illustrate most clearly how like-kind pixel-run lengths are acquired in each of the eight directions for an illustrative origin (i.e., reference) pixel.

Beginning at column 31, line 48, Kuwano goes on to explain that the direction contributivity for each like-kind pixel in the region of like-kind pixels (e.g., white) is then accumulated for all the like-kind pixels (white) in each region, for each direction . . . (A)

feature value calculation unit then calculates the feature value in each mesh region by averaging the accumulated direction contributivity value over the number of white pixels in each mesh region.

A similar methodology is associated by Kuwano with scanning over black character pixels. An important differentiating element of both Kuwano scan types, whether applied alone or combined in any particular implementation, is that, during feature extraction and characterization, any particular scan line extends across or through like-kind pixels only and terminates when the chain of serially adjacent like-kind pixels is broken.

Applicants' Attorney submits that, regardless of whatever advantages Kuwano's technique may provide, Kuwano's technique is computationally intensive and, in any event, very different from the manner in which image scanning for features is achieved by the inventors in the present case as currently expressed in each of new independent claims 20, 24 and 27. More specifically, a typical implementation of the invention presently under examination involves the "holistic scanning" of the entire character image, which includes background pixels and contrasting character pixels, along sweeping parallel scan lines extending in each direction of a predetermined set of scan directions (e.g., the four directions described in association with various implementations and shown, for example, in Applicant's FIGS. 2h through 2k). The scan lines of Applicants' variously implemented invention continue through whatever kinds of character image pixels they encounter in the course of their extension, irrespective of whether those pixels are white (e.g., background pixels) or black (e.g., character pixels), and the types of pixels encountered along the scan line are distinguished as background or character pixels, if applicable to a particular scan line. While, typically, the scan lines of Applicants' variously embodied invention extend across the entirety of the character image, scan lines of the Applicants' invention are in any event now clearly distinguished from those of Kuwano on the basis of their extension through background and character pixels as expressed in the following claims language:

" . . . and the feature extraction apparatus is programmed to:

(i) scan the character image along a plurality of parallel scan lines oriented at each scan angle of the predetermined set of scan angles, wherein each scan line of a selected set of scan lines oriented in accordance with each scan angle passes through each of (a) a character pixel-run including at least one character pixel and (b) at least one background pixel; . . . "

The language above does not require or imply that every scan line associated with a particular scan angle will pass through both background and character pixels, only that there is no specified prohibition against its doing so, as in Kuwano, and that a scan line having both background and character pixels in its path will pass through both types of pixels. Language identical or similar to the language above appears in each of the three new independent claims (i.e., 20, 24, and 27) and, combined with other limitations in the claims, so clearly departs from any feature-extraction-scanning approach suggested in Stone individually, Kuwano individually, or the combination of Stone and Kuwano as to render non-obvious the currently claimed subject matter.

In light of the foregoing amendments and remarks, Applicant respectfully submits that all claims now in the case are allowable and requests that a timely Notice of Allowance be issued in this case. If the Examiner is for any reason inclined to issue a subsequent rejection, Applicants' Attorney respectfully requests the courtesy of a telephonic interview before the issuance of such a rejection.

Extension Fees Due

The 3-month shortened statutory period for response expired on April 25, 2005. This correspondence is being deposited within the third month of extension. Accordingly, an extension petition and fee in the amount of \$1,020.00 is enclosed herewith.

Application No. 09/991,553
Response dated Monday, July 25, 2005
Reply to Office Action of January 25, 2005



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*The correspondence covered by this Certificate of Mailing includes all 19 pages of this amendment and response, a petition for an extension of 3-months to respond and a check in the amount of \$1,020.00 in support of the extension petition.